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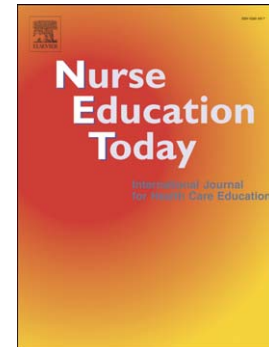
Assessment of bachelor theses in a nursing degree with a rubrics system:  
Development and validation study

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ASSESSMENT OF BACHELOR THESES IN A NURSING DEGREE WITH A RUBRICS SYSTEM:  
DEVELOPMENT AND VALIDATION STUDY

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Highlights:

- Assessment of Bachelor's Theses (BT) in nursing requires reliable and valid tools.
- An evaluation system of BT based on 3 rubrics is developed and validated.
- Results of content validity and psychometric properties are adequate.

## Abstract

*Background:* Writing a Bachelor Thesis (BT) is the last step to obtain a Nursing Degree. In order to perform an effective assessment of a nursing BT, certain reliable and valid tools are required.

*Objectives:* To develop and validate a 3-rubric system (drafting process, dissertation and viva) to assess final year nursing students' BT.

*Design:* A multi-disciplinary study of content validity and psychometric properties. The study was carried out between December 2014 and July 2015.

*Settings:* Nursing Degree at Universitat Jaume I, Spain.

*Participants:* 11 experts (9 nursing professors and 2 education professors from 6 different Universities) took part in the development and content validity stages. 52 theses presented during the 2014-2015 academic year were included by consecutive sampling of cases in order to study the psychometric properties.

*Methods:* First, a group of experts was created to validate the content of the assessment system based on three rubrics (drafting process, dissertation and viva). Subsequently a reliability and validity study of the rubrics was carried out on the 52 theses presented during the 2014-2015 academic year.

*Results:* The BT drafting process rubric has 8 criteria (S-CVI=0.93;  $\alpha$ =0.837; ICC=0.614), the dissertation rubric has 7 criteria (S-CVI=0.9;  $\alpha$ =0.893; ICC=0.74) and the viva rubric has 4 criteria (S-CVI=0.86;  $\alpha$ =0.816; ICC=0.895).

*Conclusion:* A nursing BT assessment system based on three rubrics (drafting process, dissertation and viva) has been validated. This system may be transferred to other nursing degrees or degrees from other academic areas. It is necessary to continue with the validation process taking into account factors that may affect the results obtained.

*Key words:* Nursing student; Nursing education; Bachelor's Thesis; Rubrics; Evaluation.

## INTRODUCTION

Nursing education in the European Union is undergoing major changes promoted by new educational policies that culminated with the European Higher Education Area (EHEA) implementation in 2010. European Directive 2005/36/CE (The Council of the European Union, 2005) sets the minimum training requirements for the free movement of nursing professionals within the European Union.

The harmonization of the education systems in Europe means adopting new learning and assessment methods that focus on the student, on the process and skills acquisition. One of the requirements that arise as a result of adapting the curricula to the EHEA is the development and defending of a Bachelor Thesis (BT) (Gallart *et al.*, 2015). Some countries have a long standing tradition of BTs (Kapborg and Berterö, 2002) (Baker, *et al.*, 2014), however the organization and assessment of a BT is a challenge for the new nursing degrees in Spain.

## BACKGROUND

Nursing education in Spain is no stranger to the changes brought about by the EHEA (Zabalegui y Cabrera, 2009). Nursing degrees in Spain increased from 3 to 4 years in 2010, with at least 50% of clinical training included in the curriculum and the fulfilment of a compulsory BT in order to graduate with a Nursing Degree (Spain, Royal Decree, 1393/2007) (Spain, ORDER CIN/2134/2008).

Spanish legislation establishes that the BT must carry between 6 and 30 ECTS, it must be done in the last stage of the course curriculum and must be aimed at assessing the skills associated with the degree studied (Spain, Royal Decree, 1393/2007). It is a

multi-disciplinary task related to the various subjects included in the curriculum and in which the student must demonstrate mastery of the skills acquired.

Lundgren and Robertsson (2013) define the BT as a job-orientated task, which must be original and independently done, and which each student carries out under the guidance of a supervisor. A BT can, for example, be the review of the literature or a clinical case. We can also find research BTs (Tuveesson and Borglin, 2014), although these usually belong to the Masters level (Gallart *et al.*, 2015). BTs are quite varied, although the responsibility of the student during the learning process, the independent work carried out and the development of certain skills are all common features shared by students working on a BT (Todd *et al.*, 2006).

Students can consider BTs an opportunity to work independently on a project or as a real nightmare that they must complete in order to graduate (Lundgren and Halvardsson, 2009). Moreover, the supervisor's roles are to direct, guide and advise the student in a self-directed learning process (Mansell *et al.*, 2002). Good feedback from the supervisor will improve the process and the resulting product (the BT), and can also improve the theoretical-practical integration as working professionals (Tuveesson and Borglin, 2014).

Writing a BT is a long and complex process and many actors are involved in its assessment (supervisors and thesis committee). Although there are few studies on the BT assessment, subjectivity seems frequent (Lundgren *et al.*, 2008), and it therefore seems appropriate to develop validated tools that may help unify the assessment criteria (Kapborg and Berterö, 2002). Rubrics can facilitate a more equitable and consistent assessment, avoiding subjectivity, and may also make it easier for supervisor give a feedback and for students to understand how their thesis has been assessed (Shipman *et al.*, 2012).

Rubrics are assessment tools that establish criteria and achievement levels by setting a rating scale (Shipman *et al.*, 2012). Rubrics are frequently used in nursing education in order to assess clinical judgment (Shin *et al.*, 2015), clinical laboratories (Wu *et al.*, 2015) or the skills acquisition in clinical settings (Nicholson *et al.*, 2013). However, no works have been found on their applications in the BT assessment. Improved student-supervisor communication, better understanding of the learning goals, objectivity and the standardization of the assessment process or the detection of areas for improvement are some of their advantages, although a validation and reliability process is required, and most related research lacks accuracy (Shipman *et al.*, 2012).

#### Bachelors Theses in the Nursing Degree at Universitat Jaume I

The Nursing Degree at the Universitat Jaume I (UJI) (Spain) started in 2011, once the EHEA was established (Maciá Soler *et al.*, 2013). The curriculum includes a transversal competence evidence-based practice (EBP) that is carried out in a structured manner, throughout the four years and ends with a BT. The BT is a final year subject with 12 ECTS (7 theoretical ECTS and 5 ECTS for clinical training).

In order to facilitate the BT process, the Nursing Department Council sets up a BT Commission. Five professors compose this Commission and its functions are to organize the elaboration of BT, establish the evaluation system and track learning outcomes. This Commission prepare the 'BT Organization and Development Document' and it is approved in ordinary meeting at the start of the course. The BT is a subject included in the curriculum which results in independent and individual work that each student must carry out under the supervision of a lecturer in the field of nursing of the UJI.

At the start of the academic year (September) the students are provided with a list of supervisors and topics. To encourage students' engagement, they can choose a

maximum of 5 topics of interest (Snaveley and Wright, 2003). The assignment of the topics is done in descending order according to their average grades. Each supervisor can take on a maximum of 3 BT students.

Once the students, subjects and supervisors have been assigned, the students can choose between 5 different types of BT: (i) standardized care plan; (ii) clinical case; (iii) integrative literature review; (iv) intervention plan (which includes, amongst others, health education programmes and programmes to improve health care quality); (v) research. The BT dissertation must follow specific formal criteria established by the BT Commission (structure, format and references).

The process ends with the presentation and viva before a thesis committee of three professors from Nursing Department. Before this can happen, supervisors must authorize the presentation of the works. The BT assessment system has three rubrics which assess the drafting process, the dissertation and the presentation and viva of the BT. The drafting process is assessed by the supervisor (50 % of the final grade). The dissertation and the presentation and viva are assessed by the thesis committee (30% and 20% of the final grade respectively). The final grade is a weighted grade.

In Spain there is grey literature on the assessment systems for nursing BTs (Torres Manrique et al., 2012). This literature mainly focuses on the use of rubrics, although no works have been found on their validity or psychometric properties. Thus, the main objective of this work is to develop and validate a 3-rubric system (drafting process, dissertation and viva) for the evaluation of Bachelor Theses of final year students of the Nursing Degree at the Universitat Jaume I (Spain).

## METHODS

### Design

A multi-disciplinary study was carried out. Firstly, a group of experts was created to study the content validity of a BT assessment system based on three rubrics (drafting



process, dissertation and viva). A reliability and validity study of the rubrics was then carried out on 52 theses presented during the academic year 2014-2015. The study was carried out between December 2014 and July 2015.

#### Rubrics development and content validity

A group of experts consisting of nine nursing professors from 6 different Spanish universities, with over five years of teaching experience and with experience in supervising and organising BTs or Masters Theses, and 2 education professors with experience in assessment methods. The experts were invited via personal interview, over the phone or via email. After their acceptance, the experts received an introductory letter (background, objectives and methodology) and informed consent.

The research team developed by consensus the first version of the rubrics (drafting process, dissertation and viva) after review related literature about rubrics development (Stevens and Levi, 2005) and BT assessment (Kapborg and Berterö, 2002) (Lundgren *et al.*, 2008) (Torres Manrique *et al.*, 2012). The rubrics included assessment criteria and descriptors for 4 assessment levels (fail=2.5, pass=5, good=7.5 and excellent=10). First versions were sent by email to the experts along with the 'BT Organization and Development Document' approved by the Nursing Department Council at UJI.

The experts evaluated the suitability of criteria and descriptors for each rubric using a 5-point Likert scale. They reviewed the wording and expressed their opinion in an open space, avoiding biased opinions. These suggestions were then taken into account to create the new versions. Two rounds were necessary between December 2014 and March 2015 to reach the required consensus level. After the first round, the experts received feedback, and after the second round they received the final version and a thank you letter. The rubrics were also sent to the students and supervisors.

#### Psychometric properties

A descriptive cross-sectional study was carried out to study the psychometric properties of the rubrics. A total of 52 BTs, presented on the first and second official calls during the academic year 2014-2015, were included through a consecutive sampling of cases.

Different variables related to the BT were analysed (call, type of work, thesis committee, drafting process grade, dissertation grade and viva grade). Each supervisor assessed with a rubric the students' BT drafting process (50% of the final grade) before it was presented, and three weeks after the viva, in order to analyse the intra-rater reliability (temporal stability). The thesis committees, consisting of three lecturers from the Nursing Department, assessed the dissertations (30% of the final grade) and the viva (20% of the final grade). Each member assessed the dissertations and viva independently in order to study the inter-rater reliability. The final grade for the dissertation and the viva were obtained from the average of the three independent grades granted. The final BT grade was a weighted grade. The data collection was conducted in June and July 2015.

#### Data analysis

The content validity analysis was carried out following the Polit and Beck (2006) methodology. The Content Validity Index (suitable validity  $I-CVI \geq 0.78$ ) and the Kappa modified coefficient (acceptable reliability  $K \geq 0.6$ ) were calculated for each assessment criteria and descriptors. The Overall Scale Average (S-CVI) was calculated for each assessment criteria and rubric (suitable validity  $S-CVI \geq 0.8$ ).

A descriptive analysis was performed of the final BT grades and the drafting process, dissertation and viva grades (mean and standard deviation). The normality and the homoscedasticity of the grades were analysed using, respectively, the Shapiro-Wilk's and Levene's tests before using the ANOVA or Kruskal-Wallis test to see if

there were any significant differences according to the type of work and the thesis committees. The Pearson's test was used to study the correlation between the different grades.

The intra and inter-rater reliability of the grades were studied with the Intraclass Correlation Coefficient (ICC; moderate agreement  $ICC \geq 0.41$ ). Significant differences in the grades of the drafting process were studied using the T-test or Wilcoxon's test for paired data, while the ANOVA or Kurskal-Wallis test were used for the dissertation and viva grades, according to the implementation conditions.

The assessment criteria agreement for each rubric was studied using the Spearman's correlation test and the Cohen's Kappa index (moderate agreement  $K \geq 0.4$ ) for two observers or Krippendorff's Alpha for three observers and ordinal data (moderate agreement  $\alpha \geq 0.6$ ) (Krippendorff, 2007). The internal consistency for each rubric was analysed using the Cronbach's Alpha (acceptable agreement  $\alpha \geq 0.7$ ).

The SPSS V21 software was used for the statistical analysis and the online application ReCal OIR was used to calculate the Krippendorff's Alpha coefficient. The statistical significance was found to be  $p < 0.05$ .

#### Ethical considerations

This study was approved by the Nursing Department Council of the Universitat Jaume I. There was consensus among the teachers to use these assessment tools. The anonymity of all participants was always kept and the ethical principles of the Helsinki declaration were followed.

### RESULTS

#### Rubrics development and content validity

Eleven experts took part in the rubric system content validity. Two rounds were necessary to achieve suitable validity levels. The final version of the rubric for the

drafting process of the BT included 8 criteria with S-CVI=0.93 (range of I-CVI=0.7-1; range of K=0.7-1); the rubric for the dissertation had 7 criteria with S-CVI=0.9 (range I-CVI=0.7-1; K=0.7-1); and the viva rubric had 4 criteria and S-CVI=0.86 (range I-CVI=0.8-0.9; range K=0.8-0.9). All rubrics included 4 assessment levels (fail=2.5, pass=5, good=7.5 and excellent=10) and the weighted final grade suggested was maintained. One assessment criteria for the drafting process rubric ('Reaches the goals agreed with the supervisor for each delivery'; S-CVI=0.76) and one assessment criteria for the dissertation rubric ('Relevant and measurable goals. The methodology helps reach these goals and is presented clearly and concisely'; S-CVI=0.76) did not meet the required S-CVI standards, although the S-CVI for each rubric was considered excellent and the research team decided to keep them (Table 1). A free text field was included in each rubric to increase their flexibility (Shipman *et al.*, 2012).

#### INSERT TABLE 1

##### Psychometric properties

A total of 52 BTs were included in the rubric psychometric properties study. 94.2% of the BTs (n=49) were presented on first call and only three on second call. Six thesis committees with three professors participated in the assessment. Table 2 shows descriptive analysis according to the BT type.

#### INSERT TABLE 2

Significant statistical differences were observed in the BT final grades (ANOVA;  $p$ -value=0.033) and in the final dissertation grade (Kruskal-Wallis;  $p$ =0.007) according to the type of work. No major differences were found using the Kruskal-Wallis test in the final ( $p$ =0.128), dissertation ( $p$ =0.128) and viva ( $p$ =0.639) grades according to the

thesis committee assessment. The drafting process and dissertation final grades were the only ones that did not correlated significantly ( $p=0.056$ ) (Table 3).

#### INSERT TABLE 3

The average process grade on the first round of measurements was 9.4 ( $\pm 0.12$ ). 64% of the professors ( $n=33$ ) did a second assessment with the rubric, with an average grade of 9.03 ( $\pm 0.95$ ). The Wilcoxon's test did not show significant differences ( $p<0.001$ ) and correlation with Pearson's test was 73% ( $p<0.001$ ). The ICC confirmed the intra-rater reliability for the process rubric with a value of 0.614 for individual results and 0.761 for average results ( $p<0.001$ ). According to the Cohen's Kappa test, agreements were middle/good in all assessment criteria of the drafting process rubric, except for two: 'Is able to organise the information obtained' ( $K=0.294$ ) and 'Is able to make a research question and answer it' ( $K=0.349$ ).

The Pearson's test confirmed the strong statistical correlation between the independent dissertation and viva assessments carried out by the three thesis committee members ( $p<0.05$ ). No significant statistical differences were observed with the Kruskal-Wallis test for the independent assessment of the dissertation ( $p\text{-value}=0.585$ ) and the viva ( $p\text{-value}=0.317$ ) carried out by the thesis committees. Moreover, the ICC established that the inter-rater reliability of the dissertation assessment rubric (individual results of 0.74 and average results of 0.895) and viva assessment rubric (individual results of 0.804 and average results of 0.925) were suitable ( $p\text{-value}<0.001$ ). The Krippendorff's Alpha coefficient values ranged between 0.504 and 0.719, with a weak-to-medium inter-rater agreement for the assessment criteria of dissertation and viva rubrics. The assessment criteria 'The issue is current and relevant. It is suitably justified in the introduction' for the dissertation assessment rubric was the criterion with the lowest inter-rater agreement ( $\alpha=0.348$ ).

All the criteria of the drafting process rubric showed strong correlation in the test-retest and the criteria of the dissertation and viva rubric showed strong correlation for the independent results, according to the Spearman's test ( $p < 0.05$ ). The internal consistency for the three rubrics was good with Cronbach's Alpha values above 0.8 (Process= 0.837; Dissertation= 0.893; Viva= 0.816). In no case did the Alpha increase after removing a specific item.

### DISCUSSION

In various countries of the EHEA, writing a BT is the last stage to obtain a Nursing Degree (Lundgren and Halvardsson, 2009), and this includes Spain (Gallart *et al.*, 2015). An effective assessment of nursing BTs requires reliable and valid tools that allow for an objective assessment, given that it is a long and complex process with various actors involved. Rubrics are widely used in nursing education, and allow for an objective assessment even in the case of various assessors; however, these must be validated rubrics (Shipman *et al.* 2012).

The main objective of this work was to develop and validate a 3-rubric system (drafting process, dissertation and viva) to assess the BTs of final year students from Nursing Degree at the Universitat Jaume I (Spain). In general, the results of content validity, intra and inter-rater reliability, assessment criteria correlation and internal consistency can be considered adequate. Certain aspects and limitations found during the research are discussed hereunder, considering that the literature review does not show any other work that uses validated rubrics for BT assessments.

A well-designed and formulated rubric can be an effective evaluation tool, but rubrics need to confirm their fairness. Without a reliable evaluation tool, issues of inconsistency, subjectivity or lack of equity can undermine the evaluation process (Shipman *et al.*, 2012). Several methods can be seen in literature to explore validity and

reliability of rubrics. Nicholson *et al.* (2009, 2013) use the Rash model to explore psychometric properties of a rubric, and explore inter-rater reliability with CCI and internal consistency with Cronbach's Alpha. Lasater (2007) develop a rubric using a qualitative-quantitative-qualitative design, and later other authors have studied psychometric properties (Adamson *et al.*, 2012) (Shin *et al.*, 2015). Other rubrics have been developed by consensus and this might affect their content validity (Torres Manrique *et al.*, 2012). To avoid this weakness, we use a specific method of content validity (Polit and Beck, 2006). This method could be similar to Delphi method, but we only use I-CVI and K as cut points, and not agreement percentage or means and medians as RAND Corporation recommend (Fitch *et al.*, 2001). Furthermore assessment criteria and descriptors reliability seem not studied in literature. We study it with Spearman's correlation test and Cohen's Kappa or Krippendorff's Alpha. Methods used in this study offer good results and this could be considered as strength of the study. Moreover, standardization of methods to develop and validate rubrics seems appropriate.

On the other hand, statistical differences were found in the BT final grades and in the final dissertation grades according to the type of work. Even though the psychometric properties of the rubrics are good, using the same rubrics to assess different types of work can affect the results obtained. The academic achievements of the students or the academic degree of the supervisors are factors that have not been controlled in this study and can affect the results. In a subsequent analysis it was confirmed that there were important statistical differences between the average grades in the academic record according to the type of BT ( $p\text{-value}=0.94$ ) and a correlation in 40% of the cases, as well as between the average grade of the academic record and the final BT grade ( $p\text{-value}=0.003$ ). These results may confirm the hypothesis that students

with a lower academic record chose projects that seemed easier, such as clinical cases and intervention plans, although this didn't seem to improve the grade obtained, furthermore it is possible the use of rubrics could be a contributing factor to this.

Moreover, the grades granted by the supervisors (BT drafting process) are the highest grades for all BT types, with a possible inflation effect on the final BT grade. Furthermore, the final grades for the drafting process (supervisors) and the dissertation (thesis committee) were the only ones that were not clearly correlated. These results agree with Lundgren *et al.* (2008) when comparing supervisors' grades with thesis committees, using the same tool. In our case, the supervisors assessed the process instead of the product (the BT) using different criteria than the thesis committees. Furthermore, there were no significant differences in the re-test carried out three weeks later. Lundgren *et al.* (2008) suggest that supervisors should not assess the BT, given that they are involved in it. In the upcoming years, it should be reconsidered whether the supervisor's assessment should be included in the final BT grade or whether strategies that promote objectivity of supervisors' assessment should be developed.

The final grades granted by the thesis committee did not show major differences, thus proving the validity and objectivity of the assessment rubrics for the dissertation and viva, however, the results suggest that the agreement in the committee assessments could be improved. This could be as a result of the fact that the group of professors that make up the thesis committees is mixed (full-time and part-time professors, with different degrees or different professional experience). In the following years the homogenisation of the thesis committee members, and their knowledge of the BT subjects, should be taken into account. On the other hand, this is a descriptive cross-sectional study, with a reduced sample from only one university and these limitations may affect the results.



## CONCLUSIONS

An effective assessment of nursing BTs requires reliable and valid tools. In this work, a rubric-based BT assessment system has been validated. The system is made up of an assessment rubric for the BT drafting process (8 criteria), a rubric for the dissertation assessment (7 criteria) and an assessment rubric for the BT viva (4 criteria). The three rubrics included a 4-level assessment scale (fail=2.5, pass=5, good=7.5 and excellent=10). The BT drafting process assessment is 50% of the final grade, the dissertation is 30% and the viva is 20%.

The development and defending of a Bachelor Thesis is one of the requirements that arise as result of adapting the curricula to the EHEA, affecting degrees from different academic areas, not only nursing or health science degrees. To study the application of this evaluation system in other Spanish or abroad nursing degrees, or different academic areas, seems appropriate

The validity of the tools is an active and dynamic process. In future research, we recommend taking into account variables can affect BT assessment as average grade of students or academic level and professional experience of supervisors and thesis committee members. Furthermore, we recommend analysing the effect of the supervisor assessment on the final grades and the difference with the thesis committee assessments.

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**Table 1. Overall Content Validity Coefficient (S-CVI) for each rubric and criterion.**

Rubrics and criterions	S-CVI
<b>Bachelor Thesis drafting process assessment rubric</b>	0.93
Regularly and punctually attends meetings with the supervisor	1
Follows the programme agreed with the supervisor	0.82
Reaches the goals agreed with the supervisor for each delivery	0.76
Active attitude throughout the BT drafting process	1
Makes a research question and answers it searching in the literature	1
Sets suitable goals and uses suitable methodology	0.96
Coherently organises the information obtained	0.98
Summarises relevant results and compares with recent literature	0.9
<b>Bachelor Thesis dissertation assessment rubric</b>	0.9
Current and relevant issue. Suitably justified in the introduction	0.88
Relevant and measurable goals. The methodology is appropriate to reach those goals	0.76
The results are well organised, relevant and are appropriate to the BT	0.82
Literature discussion and conclusion are coherent with the goals set	1
Suitable bibliography and good references according to the chosen standards	1
The dissertation meets the formal criteria	0.96
Good written communication which denotes professionalism	0.9
<b>Bachelor Thesis viva assessment rubric</b>	0.86
Attitude is correct during presentation and viva	0.8
Clear and motivating communication	0.88
Shows good knowledge of the subject	0.9
Good use of the technology available and the different presentation sections	0.9

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**Table 2. Descriptive analysis of the grades according to the type of Bachelor Thesis (BT)**

Type of BT	n	%	Average grades			
			Drafting	Dissertation	Viva	Final
Care plan	7	13.5	8.8(±1.09)	6.7(±1.46)	7.7(±1.56)	8.1(±0.79)
Intervention plan	5	9.6	8.9(±1.25)	6.2(±1.64)	7.6(±1.13)	7.4(±1.93)
Integrative review	23	44.2	9.4(±0.73)	7.1(±1.52)	8.5(±1.36)	8.5(±0.89)
Clinical case	4	7.7	9.7(±0.45)	7.1(±1.43)	7.8(±1.07)	8.6(±0.82)
Research	13	25	9.5(±0.75)	8.1(±1.16)	8.8(±0.75)	9.1(±0.67)
Total	52	100	9.4(±0.84)	7.3(±1.6)	8.3(±1.26)	8.5(±1.05)



**Table 3. Correlation between the final grades, drafting process, dissertation and viva**

		<b>Grade</b>		
		<b>Final</b>	<b>Dissertation</b>	<b>Viva</b>
<b>Dissertation grade</b>	Pearson	0.825		
	p-value	<0.001		
<b>Viva grade</b>	Pearson	0.736	0.698	
	p-value	<0.001	<0.001	
<b>Process grade</b>	Pearson	0.669	0.266	0.345
	p-value	<0.001	0.056	0.012